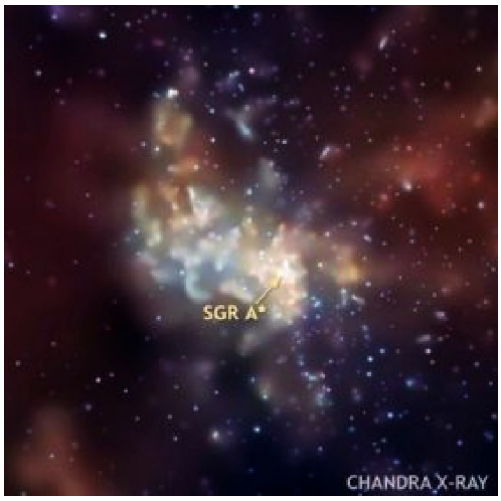
Suzaku News You Can Use

Volume 3 - Number 3 31 October 2008

In this issue...

Latest Suzaku News

— A Napping Giant at the Center of the Milky Way



Careful collection of data on an object from many sources over a long period of time can help scientists understand the present and reconstruct the past.

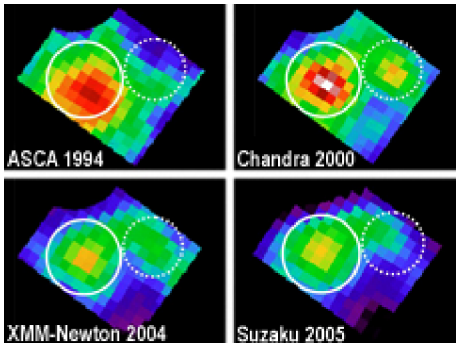
At its center, the Milky Way galaxy has a black hole that is 4 million times as massive as the Sun. For such a massive, prominent object, it is very "quiet", radiating much smaller amounts of energy compared to the energy given off by other black holes. This object, known as Sagittarius A* (pronounced "A-star", abbreviated Sgr A*) has become a heavily studied object in X-rays. In recent years, it has been a target of study by satellites such as ASCA, XMM-Newton, Chandra, and Suzaku. The data collected have revealed a key to understanding some of the mysteries of this object.

A massive burst of energy occurred over 300 years ago in Sgr A* and is reflected in the condition of the gaseous remnants around it. What are the findings, and how have X-rays revealed the secrets of this sleeping giant? Read on and find out in other sections of this newsletter.

Objects of Interest in X-Rays

— More on Sgr A*

Using data collected from 1994-2005, scientists measured extreme changes over time in the X-ray emissions from a cloud of gas near Sgr A* (see image). The cloud is 300 light years closer to us than the black hole at our Galaxy's center but still 26,000 light years away.



Apparently, the black hole has not always been quiet. Over the years it was studied, the cloud brightened and faded quickly in response to X-ray pulses from just outside the black hole.

By resolving the X-ray spectral line from iron, Suzaku's observations were able to show the cause. When gas spirals inward toward a black hole, it is heated to millions of degrees and emits X-rays. The more the matter piles up, the greater the X-ray output. When the X-rays reached the cloud, they collided with iron atoms there, kicking out electrons close to their nuclei. As electrons from farther out in each atom fell in to fill the gap, they emitted X-rays.

Why is Sgr A* so quiet now? Perhaps it's just resting from this huge event.

(See http://www.nasa.gov/centers/goddard/news/topstory/2008/blackhole_slumber.html -- Image credits: ASCA and Suzaku: JAXA; Chandra: NASA/CXC; XMM-Newton: ESA)

A Brief History of X-Rays
— X-ray Observatories of the Last Decade

Over the past decade, X-ray astronomy has grown by leaps and bounds. Part of the reason for this growth is the multinational array of X-ray missions that have been launched. We will give some background on three that are involved in Sgr A* studies.

ASCA (formerly known as Astro-D) was the result of a collaboration between Japan and the US, the second of its kind, where the US provided part of the payload for the mission. It was launched in early 1993 and gathered data until 2000, finally reentering the atmosphere in 2001. ASCA's most spectacular scientific discoveries were in the study of supernova remnants. ASCA was the first X-ray mission that had CCD (imaging) detectors on board. (More on ASCA at http://heasarc.gsfc.nasa.gov/docs/asca/outreach/asca_asca.html)

XMM-Newton was launched by the European Space Agency (ESA) in late 1999, and continues in operation today. NASA provides the Guest Observer Facility (GOF) for U.S. observers at GSFC. XMM-Newton carries both X-ray and optical telescopes, allowing the mission to meet a general goal of detecting and identifying X-ray sources. Scientifically valuable findings by XMM-Newton have spawned over 2100 refereed scientific papers to date. XMM-Newton studies include probing the central regions of black holes, studying the properties of massive black holes at the centers of galaxies, and studying dark matter in clusters of galaxies. See the XMM-Newton GOF site at: http://heasarc.gsfc.nasa.gov/docs/xmm/xmmhp_aboutxmm.html

Chandra was also launched in 1999 and today continues to provide excellent data and images of X-ray astronomical sources. Chandra is a NASA mission that has well-exceeded its originally expected lifetime of five years. Its telescopes and scientific instruments have provided outstanding results that have impacted all areas of X-ray astronomy. In addition to simply detecting X-rays, its high precision instruments allow for the analysis of the X-rays collected. Chandra has provided data leading to advances in every area of X-ray astronomy, including the study of supernova remnants, galaxy clusters, ancient quasars and black holes. The Chandra X-ray Observatory site is at http://www.nasa.gov/mission_pages/chandra/main/.

Resources For All
— Collaborative X-ray Astronomy

Over the past decade, a golden age of X-ray astronomy has begun. This has been led by the development of spacecraft instruments with greater spatial and energy resolution. Since accuracy and precision are topics that are discussed at the outset of most science and physics courses, especially in a lab setting, providing related real life examples of such might be valuable, especially as an authentic activity for students.

Consider the four spacecraft, ASCA, Chandra, XMM-Newton and Suzaku. All have been valuable to the X-ray astronomy community. When were they taking data? What instruments were aboard? For each instrument, what are its energy resolution and position resolution? What range of wavelengths did it study? An application and synthesis question might be: Why is it important to have measurements from different spacecraft?

To help answer these questions, each mission has its own site referenced in the previous article. And, of course, for Suzaku you are invited to the Suzaku Learning Center at http://suzaku-epo.gsfc.nasa.gov/docs/suzaku-epo. Additionally, the following sites might be helpful:

* http://imagine.gsfc.nasa.gov/docs/sats_n_data/missions/asca.html (ASCA)

* http://imagine.gsfc.nasa.gov/docs/sats_n_data/missions/xmm.html (XMM-Newton)

* http://imagine.gsfc.nasa.gov/docs/sats_n_data/missions/chandra.html (Chandra)

Trivia Question:

Why is there a star (*) in the name Sagittarius A*?

The first person to answer correctly… will win educational materials from the Imagine the Universe! team.

Suzaku News You Can Use

From the last edition:

AE Aquarii is a type of variable star that is actually the smaller of two stars that share a common center of gravity. Also, the white dwarf's gravitational field pulls matter from its companion. What is the common, scientific name for these types of variable stars?

Answer: Cataclysmic variables

We have no winner from the previous trivia question.

To sign up for our newsletter, visit us online at:
http://suzaku-epo.gsfc.nasa.gov/docs/suzaku-epo/newsletter/suznuzservice.html